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Title: Seeing is Believing? Understanding the Interplay Between Observations and Simulations of Star Formation

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Seeing is Believing?

Understanding the Interplay Between Observations and Simulations of Star Formation

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NNSA National Nuclear Security Administration

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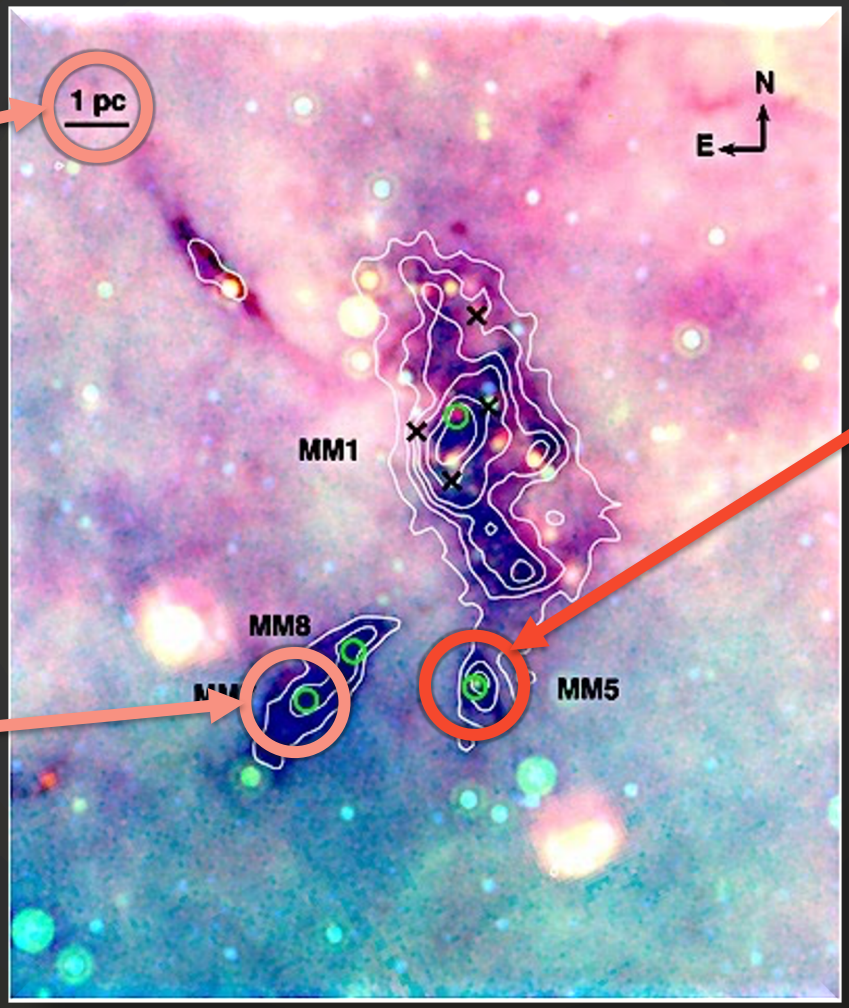
What is star formation?

The gravitational collapse of dense gas into a star

1 parsec ~ 10^{16} m

Process takes a few million years

"Dense gas" ~10^{4}-10^{8+} H_2/cm^3



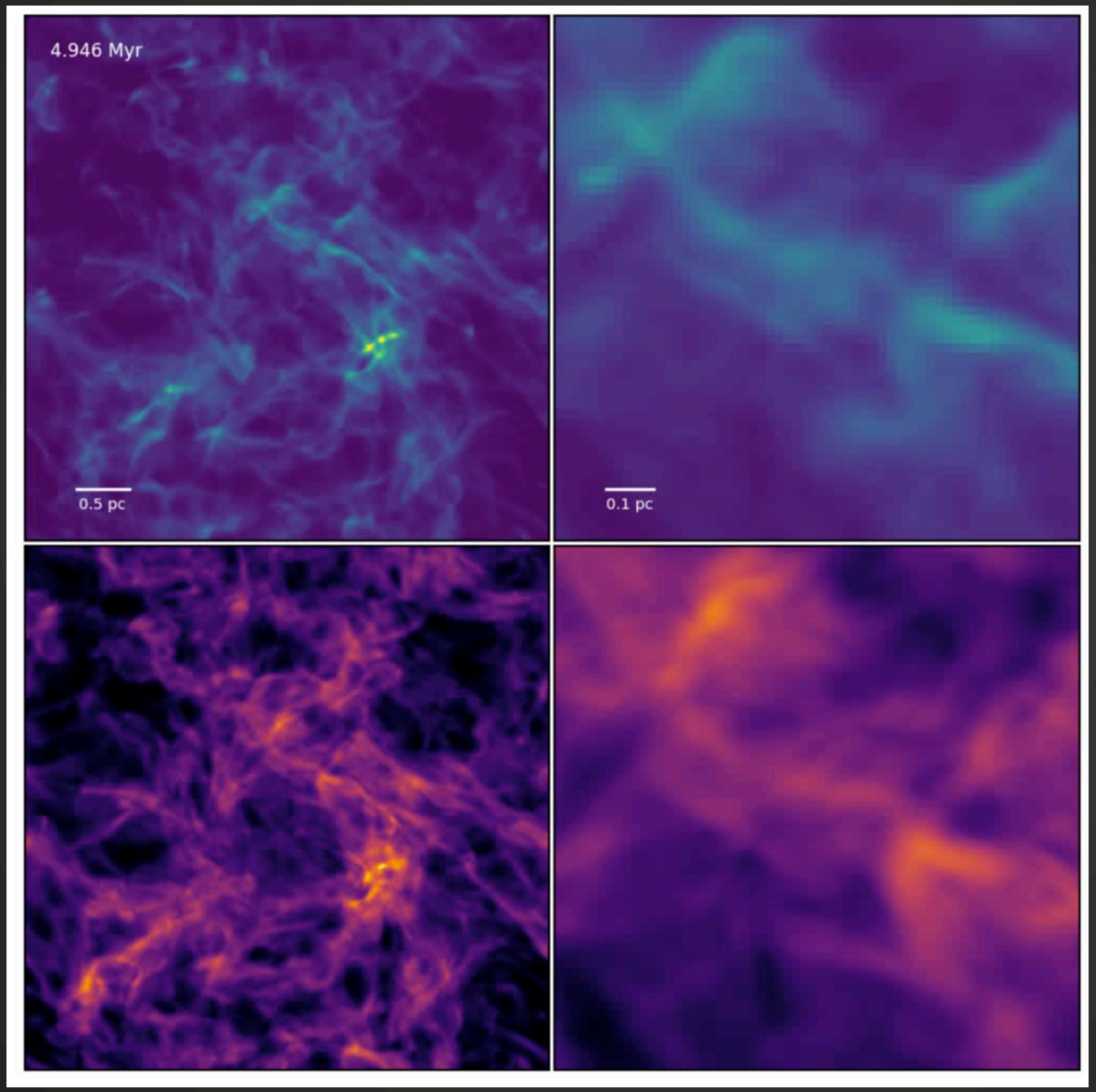
"Core"
Gravitationally-bound gas that will likely form a star

Observation of G28.53-0.25: Lu+2015

Star formation is a confluence of many physical processes

Simulation (Gas density)

Observation (Ammonia: NH_3)



Gravity

Fluid Dynamics

Turbulence

Magnetic Fields

Radiation

Chemistry

Shock physics

and more...

What are the
time-evolving
observational and physical
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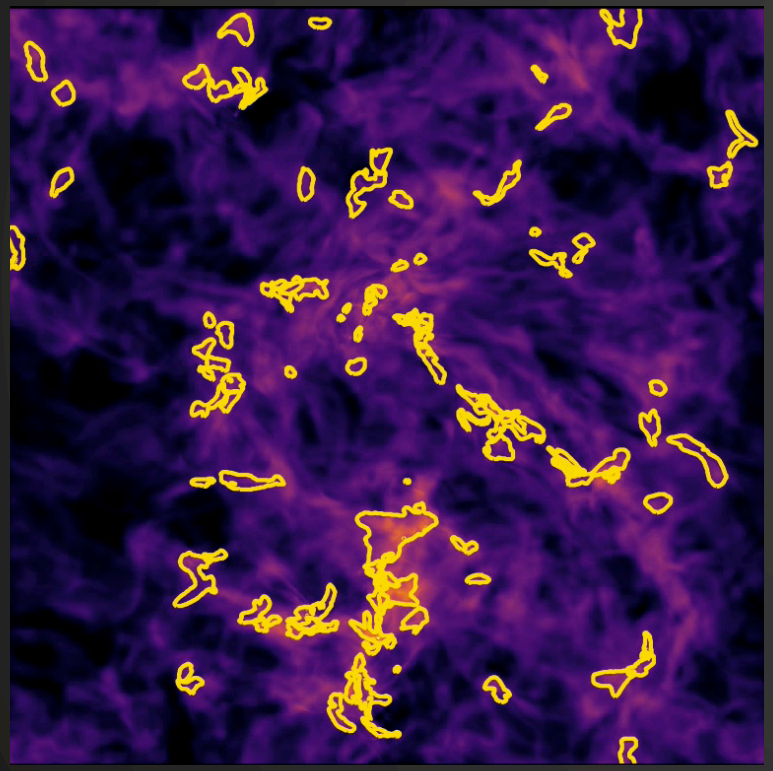
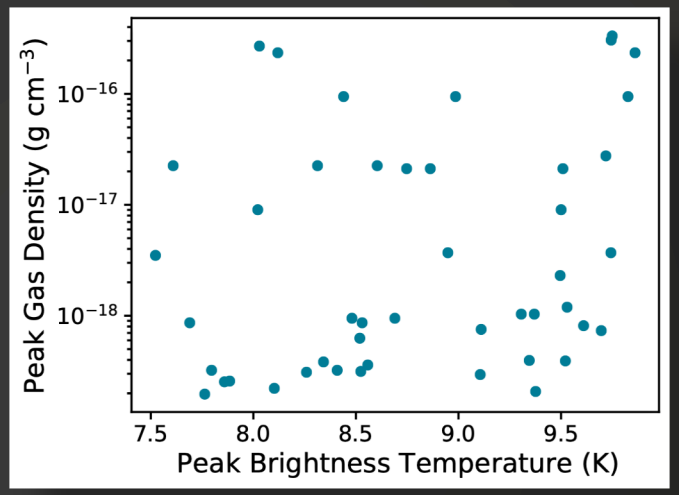
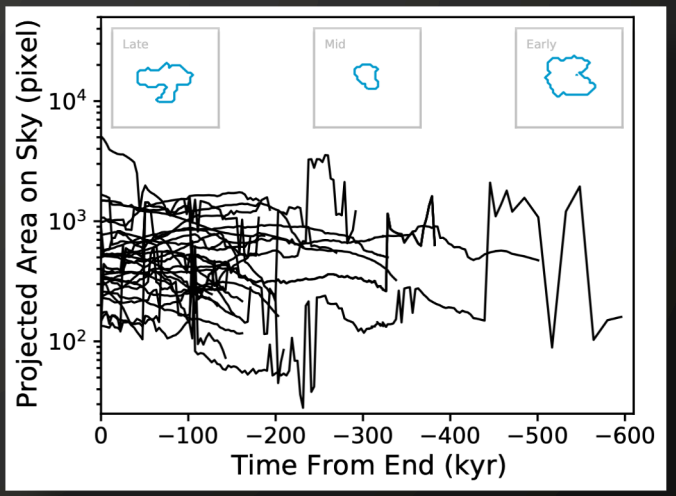
What are the time-evolving observational and physical properties of gas that will form a star?





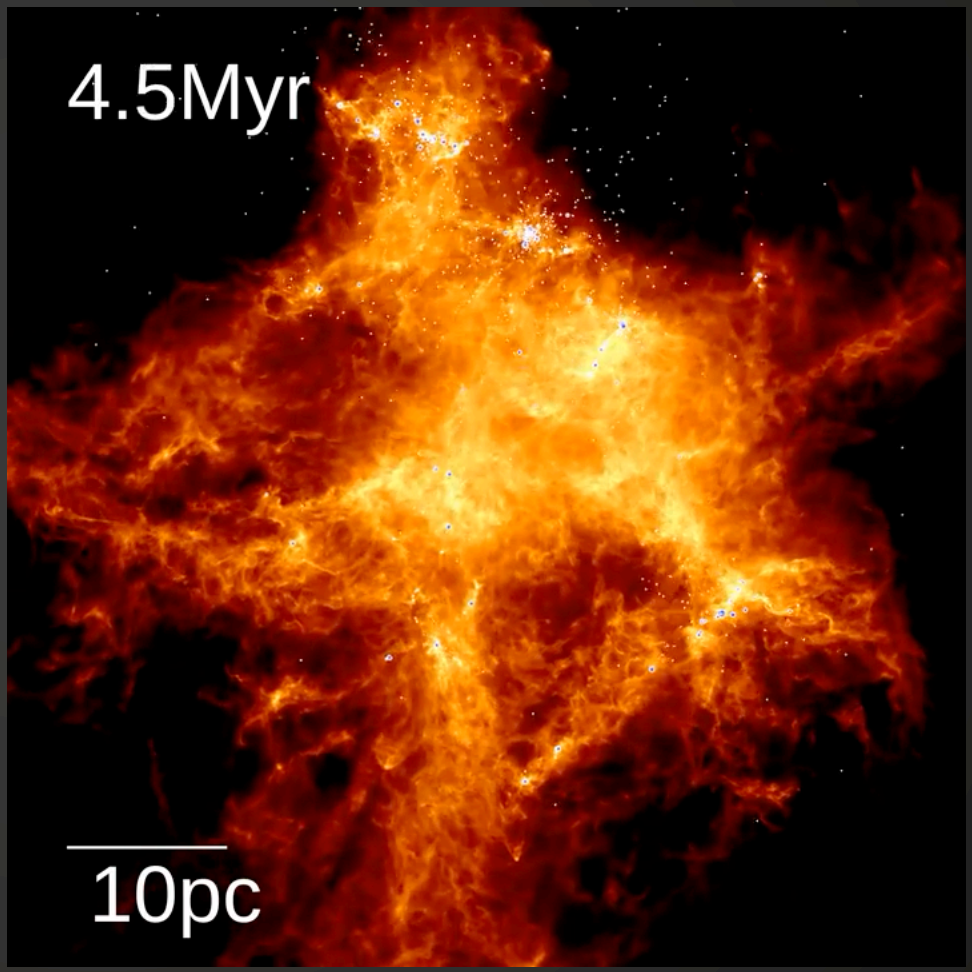
Correlating "reality" and observations at one time:
characterize trends/ possible mistakes in observation interpretation

Understanding time evolution of cores:
current structure finders aren't adaptable for changing environments



Looking toward the future

- For more statistical power, will use *state-of-the-art simulations* from the STARFORGE collaboration
- Will develop *new, flexible techniques* for identifying and tracking cores through time



STARFORGE collaboration; Grudić+2020